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Monte Carlo Modeling of Neutron and Gamma-Ray Imaging Systems

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Presentation : oral presentation preferred

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Brief Biography :

James Hall has been at Lawrence Livermore National Laboratory since 1987. His early work at LLNL involved the design and execution of experiments associated with the U.S. Nuclear Test Program (primarily neutron and gamma-ray measurements). He is currently involved with the design of neutron and gamma-ray diagnostics for the NOVA and NIF laser systems at LLNL, low-energy neutron radiographic diagnostics for nuclear stockpile stewardship and search schemes for nuclear counter-proliferation.

Abstract Text :

Monte Carlo Modeling of Neutron and Gamma-Ray Imaging Systems*

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Detailed numerical prototypes are essential to the design of efficient and cost-effective neutron and gamma-ray imaging systems. We have exploited the unique capabilities of an LLNL-developed radiation transport code ("COG") to develop code modules capable of simulating the performance of neutron and gamma-ray imaging systems over a wide range of source energies. These routines allow us to simulate complex, time-dependent radiation sources, model 3-dimensional system geometries with "real world" complexity, specify detailed elemental and isotopic distributions, and predict the responses of various types of imaging detectors with full Monte Carlo accuracy. COG references detailed, evaluated nuclear interaction databases (ENDL and ENDF-B) thereby allowing us to account for multiple scattering, energy straggling, and secondary particle production phenomena which may significantly effect the performance of an imaging system but which are difficult or even impossible to estimate using simple analytical models. In this work we will present examples illustrating the recent use of these routines in the analysis of nonintrusive luggage and cargo inspection systems, industrial radiographic systems for thick target inspection, and international treaty verification.

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